Section 06

Repair Instructions for Standard Shutters.

SYNCHRO-COMPUR: -

CN-1110-000 & CN-1210-000 2
CN-1110-010 5
CN-1110-020 6
CN-1110-030 7
CN-1210-022 8
CN-1210-040/041/042/047 10
CN-1110-016 12
CN-1110-018 13
CN-1110-024 14
CN-1110-025 & CN-1110-019. 18
CN-1110-026 19
CN-1110-034 21
CN-1110-035 23
CN-1210-051 27
CN-1307-000 31

COMPUR-RAPID:-

CN-1112-004 26

COMPUR:-

CN-1914-000 28
CN-1915-001 35
CN-1916-001 36

SYNCHRO-COMPUR 00-MXV
with Tensioning Ring CN-1110-000 and CN-1210-000

Cleaning the Shutter

It is imperative to remove parts or assemblies from the shutter for cleaning, which should be done by rinsing them in clean, grease-free trichloroethylene or perchloroethylene. Escapement and selftimer mechanisms should not be disassembled for cleaning.

Before reinstalling parts in the shutter, be sure they are completely dry and regreased in accordance with the lubricating instructions.

Enameled parts and parts with filled engravings or mounted f-scale should never be wet-cleaned. Use a soft chamois leather or brush.

Lubricating Instructions

The necessary lubricants, herein termed, A, B and C (see Lubrication Schedule), can be ordered from our Service Department. We will not authorise the use of any other lubricants as only those tested in our factory will ensure proper functioning of shutters.

Apply a thin film of the prescribed lubricant to a glass plate and use a fine brush or foam rubber swab to apply the lubricant at the required points. Be sure to stir Lubricant A briskly before use.

Lubrication Schedule 1110–000 indicates both the points to be serviced and the required lubricants.

After cleaning, use Lubricant A to service the following parts not listed in the Lubrication Schedule:

Base plate 201: All shafts, bearing bushes and other parts riveted in position.

Escapement 300 and selftimer 400: All bearings. (The tooth flanks of bright brass gear wheels should also be slightly lubricated; gear wheels and pinions having a grey lustre have been lubricated by a special process during manufacture and never need any subsequent lubrication.)

Assembly and Adjustments

	CN-1110-000 Plate
1. Adjust the **exposure setting ring for** smooth operation by tightening the threaded ring 547 more or less firmly. After this adjustment is completed, use the retaining screws 538 to lock the threaded ring at the nearest possible point.	1
2. The **cam ring 552** must be a play-free fit on the mounting tube 204. If necessary, take up play by widening the slots in the cam ring.	2
3. The **tensioning pinion 517, tensioning ring 528 and drive 514** determine the length of travel during tensioning between the locking of the M-detent and the jumping-back of the blade opening pin in the blade ring 202.	2

CN-1110-000
Plate

Due to possible differences in the tensioning and release locks incorporated in the camera, the length of travel may have to be adjusted in any of the following ways:

A Engagement of M-detent
occurring simultaneously with or shortly after the engagement of the opening pin.

A_1 Engagement of M-detent shortly before or after engagement of the opening pin.

B Engagement of M-detent
occurring simultaneously with or at any desired time before the engagement of the opening pin.

C Engagement of M-detent
occurring simultaneously with or shortly before the engagement of the opening pin.

The required adjustment is indicated in the applicable Parts List by the letter (A, B or C) used as a prefix to the Stock Number of the tensioning pinion.

If 514, 517 or 528 has to be replaced, the length of travel will have to be checked and readjusted.

In the case of adjustments A and C, the width of the lug on the tensioning pinion should be reduced parallel to the surface of the drive at the point indicated by an arrow in Plate 2. Where the width of the lug is insufficient, a new tensioning pinion should be fitted and adjusted as necessary. Adjustment B requires no additional operations.

Insert the tensioning pinion so that its first tooth engages in the first tooth gap of the tensioning ring.

The three different adjustments just discussed are based on the use of the M-detents and tensioning pinions listed in the Parts Lists. In the case of manually cocked shutters, the tensioning lock is mounted on the M-detent. Where the closing element is coupled to the film winding mechanism, no tensioning lock is used. The M-detent required in each particular case is identified by the number of the Parts List.

4. **Bridge 621 with Locking Lever:** Simultaneously with the jumping-back of the opening pin in the blade ring 202 the locking lever should prevent any return movement of the drive 514. Where parts 514 and/or 621 have to be replaced, this function has to be adjusted by rotating the eccentric locking lever pivot 663 (Fig. 7). 4 & 9

5. **Escapement 300:** The depth of engagement of the escapement lever is adjusted at the factory in such a manner that, with the lever plate 319 resting against adjusting lug of plate 301, it amounts to 1/2 to 1/3 of the height of the tooth (Figs. 1 & 2). 5 & 9

   Push the lever plate towards the periphery of the case to permit insertion of the escapement.

Shutter Speed Adjustment (to be performed in the order given)

1 Second (Fig. 3)
Back off the two securing screws and pivot the escapement about the screw 304 on the lever side (towards the mounting tube for increased exposure time, or towards the periphery of the case for shorter exposure time). Firmly tighten the two securing screws upon completion of adjustment.

$^{1}/_{15}$ Second (Fig. 4)
With the cam ring 552 in position, bend the detent pin as required (towards tubular mount for shorter exposure, and towards the periphery of the case for longer exposure).

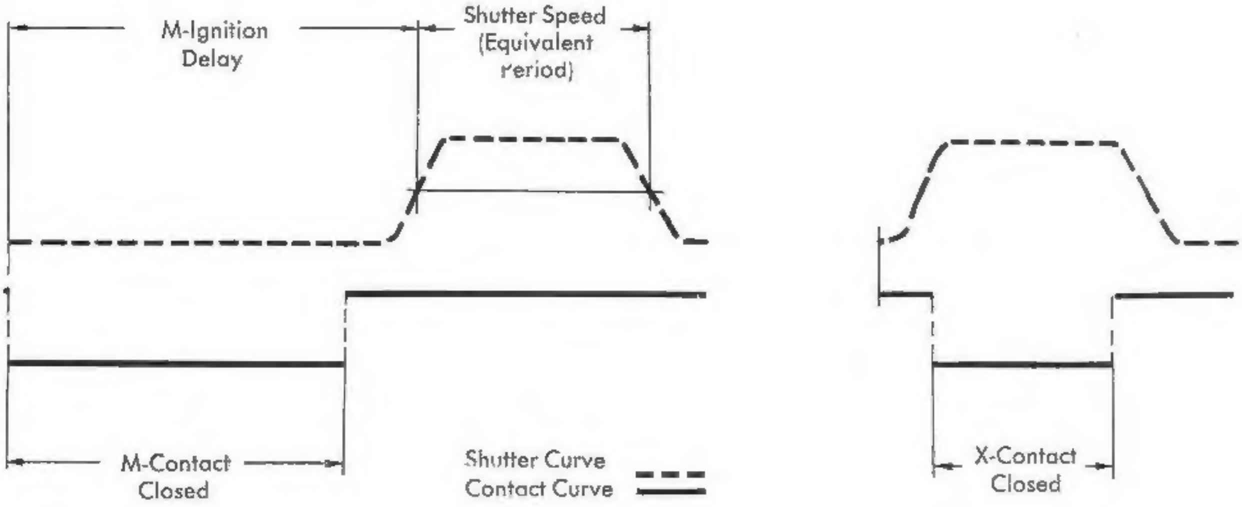
CN-1110-000
Plate

$^{1}/_{500}$ Second (Fig. 5)
The cam ring should render the escapement lever 341 inoperative to such an extent that the drive 514 can run down without any obstruction. For this purpose, the pin of the check lever should be bent as required (Fig. 5).

After these three adjustments have been made, all other shutter speeds will automatically be timed correctly.

The various shutter speeds are subject to the following tolerance limits:

Shutter Speeds	1 2 4 8 15 30 60 125	250 500 (1/s)
Tolerance Limit	± 15%	± 20%



6. **Selftimer 400:** Insert the mechanism in a half-wound condition and allow mechanism to run down after insertion. The running-down time is 8 to 10 seconds and need not be adjusted. 6 & 9

   The stop 298 for the V-detent lever 421 is in the form of an eccentric, thus permitting the play to be adjusted between the V-detent lever and the blade ring 202 (Fig. 6). The play should be such that, with the selftimer out of operation, the blade ring can run down freely and that the selftimer, when used, will run for no more than one second after the shutter is released.

7. **Stop 299** should be pressed against the tubular mount 204 while being fitted.

8. **The blades 208** and their bearings must be completely free of grease. The sequence in which the parts are to be fitted is shown by the small numerals 1 to 5 in the illustration, beginning with the bearing sleeve of the drive 514. In size 0 shutters (CN–1210–000), the points of the first blade 268 and the last blade 267 are bent slightly upwards to improve their sliding action. "Lastina" varnish 22773, black, should be applied to the fastening screws 230 of the blade mounting plate to lock the screws in position.

CN-1110-000
Plate

9. **The M-cam check lever 696, M-anchor plate 627, M-detent lock 664 and V-detent lever 421** are riveted in position on the base plate 201. When any of these parts has to be replaced, the respective rivet(s) will have to be removed by drilling. Extreme care must be exercised during riveting to prevent the base plate from being distorted. 7

10. **Diaphragm Segments 105:** Both the segments and their bearings should be kept completely free of grease. 8

11. **Synchronisation:** 4 & 9

    The minimum contact gap with the shutter cocked should be 0.5 mm. (0.020") (Fig. 7) (In the case of Synchro-Compur, measure the contact gap in the M position).

    Minimum contact pressure in X position: 60 gms. (2.1 ozs.) (Fig. 8).

    X-contact closes as soon as the blade points lie between a circle 15.5 mm. (0.610") diameter (size 00) or 22.0 mm. (0.778") diameter (size 0) on the one hand and the full diameter of the shutter aperture.

    Any deviations from the above values should be compensated for by bending the contact spring 615 fixed to the X-contact lever as required.

    The M ignition advance period as measured between the closing of the contact and the point at which the shutter aperture is one-half open should be 16½ milliseconds ± 10%.

    To adjust the M ignition delay, back off screw 618 and rotate eccentric 298 as required. (Fig. 7). This will change the tension of the detent spring 641.

    The delay will be shortened by an increase in spring tension and lengthened by a reduction in spring tension. Finally be sure to retighten screw 618 firmly.

    The pressure of the M-contact, which is determined by the design of the shutter, should be at least 10 gms. (0.35 oz.).

12. **Concentricity and Planar Trueness:**

Concentricity:	Maximum eccentricity between mounting tube 204 and casing 101: 0.01 mm.
Planar Trueness:	Maximum wobble between lens seating of mounting tube and lens seating of casing: 0.01 mm.

SYNCHRO COMPUR 00-MXV "Standard" CN-1110-010

CN-1110-010
Plate

Cleaning the Shutter: See CN–1110–000

Lubrication Instructions: See CN–1110–000
See also Lubrication Schedules CN–1110–000 and CN–1110–020

Assembly and Adjustments

The relative position of **the diaphragm setting ring 590 and diaphragm ring 108** is determined by a groove cooperating with a lug. 1

The relative position of **the exposure control ring 539, shutter speed coupling ring 163 and cam ring 552** is determined by grooves cooperating with lugs. 1

Items 1 to 11 are the same as under CN–1110–000.

SYNCHRO-COMPUR 00-MXV Reflex BH CN-1110-020

Cleaning of Shutter:	see CN–1110–000	
Lubrication Instructions: See also Lubrication Schedules	see CN–1110–000 CN–1110–000 and CN–1110–020	 CN–1110–020 Plate

Assembly and Adjustments

Exposure control ring: Proper operation of the setting ring is ensured by the design of the shutter.

Tensioning pinion 517 should be inserted so that the first tooth of the tensioning ring engages between the tensioning lug and the first tooth of the tensioning pinion. 3

Blades 208 and 267 and their bearings must be completely free of grease. The sequence in which the parts have to be fitted is shown by the small numerals 1 to 5 in the illustration. No. 5 blade (267) has a recess accommodating the tensioning shaft. 3

When inserting the shutter into the mount 745, depress setting ring lock 747. Firmly tighten screw-on ring 102 and screws 109. 2

Bayonet Retaining Ring 730: Firmly tighten screws 743. 1

The recess on the knob side of **diaphragm setting ring 590** should drive the lug of the diaphragm ring 108 and the stop rivet should lie between the two stop pins of the sleeve 746. 1

The relative position of the **shutter speed coupling ring 163, exposure control ring 539** and **cam ring 552** is determined by grooves and lugs. 1

Contact: Spring action should firmly urge the contact strip 601 of the shutter against the nipple 600 of the mount 745. The contact must be free of grease and should show no signs of corrosion. 2

Concentricity and Planar Trueness Test:

Concentricity: Maximum eccentricity between mounting tube 204 and housing 101 to be .015 mm. or .0006".

Planar Trueness: Maximum wobble between camera seating of shutter mount 745 and lens abutment of bayonet retaining ring 730 to be .03 mm. or .0012".

Maximum wobble between lens seating of bayonet retaining ring 730 (reference) and lens seating of housing 101 to be .015 mm. or .0006".

Maximum wobble between lens seating of housing 101 and lens abutment of mounting tube 204 to be .015 mm. or .0006".

Items 2, 4 to 7 and 9 to 11 as under CN–1110–000.

SYNCHRO-COMPUR 00-MXV "Wide" CN-1110-030

Cleaning of Shutter:	see CN–1110–000	
Lubricating Instructions: See also Lubrication Schedules	see CN–1110–000 CN–1110–000 and CN–1110–030	CN–1110–030 Plate

Assembly and Adjustments

Exposure Control Ring: Proper operation of the exposure control ring is ensured by the design of the shutter.

The **blades 208, 267 and 268** and their bearings must be completely free of grease. The sequence of assembly is shown by the small numerals 1 to 5 in the illustration. The second of the blades 267 has a recess accommodating the tensioning shaft. 2

The covering blade 268 is taken as the sixthblade and placed on the pivot of the first blade, so that the fifth blade lies between the first and sixth blades.

Bayonet Retaining Ring 730: Firmly tighten screws 743. 1

The relative position of the **shutter speed coupling ring 163, exposure control ring 539** and **cam ring 552** is determined by grooves and lugs. 1

Concentricity and Planar Trueness Test:

Concentricity: Maximum eccentricity between bayonet retaining ring 730 (centering diameter for quick-change mount) and inner diameter of outer cover ring 738: .07 mm. or .0028".

Maximum eccentricity between bayonet retaining ring 730 (centering diameter for shutter speed coupling ring 163) and outer diameter of front portion: .05 mm. or .002".

Planar Trueness: Maximum wobble between bayonet retaining ring 730 (lens seating) and camera seating to be .03 mm. or .0012".

Items 2 to 7, 9 to 11 as under CN–1110–000.

SYNCHRO-COMPUR 0-MXV CN-1210-022

GH-Reflex 103

Cleaning of Shutter: as under CN–1110–000

Lubricating Instructions: as under CN–1110–000
See Lubrication Schedule CN–1110–000 and
CN–1210–022

CN-1210-022
Plate

Assembly and Adjustments

Exposure Control Ring: Smooth operation is ensured by design features. 1

The **engraving strip 541** and the speed selector ring 539 are fixed in relation to each other by means of a lug and groove. Attach the strip snugly to the selector ring and secure it with the screws 029.

Tensioning spur wheel 523 ist the component which links the shutter to the camera or, in the case of quick-change mounts, to the helical focusing mount. To ensure proper interaction of shutter and camera and to permit easy coupling in the case of quick-change mounts, special attention must be paid to the correct angular position of the driving faces of the tensioning spur wheel. The angular errors of the tensioning spur wheel, which are due to the drive system, are kept as small as possible by selecting the optimum tensioning spur wheels.

The tensioning spur wheel must be installed so that, with the shutter untensioned, the marking on the dedendum circle points to the entre of tensioning gear 522. 3

When it is necessary to replace the tensioning spur wheel, the following procedure is recommended:

Temporarily insert a tensioning spur wheel bearing identifications number "13" in the shutter; then, using gauge LZ 51 1210 022 000, tension the shutter sufficiently to take up the play of the whole tensioning assembly, i. e. until the tensioning ring begins to move. The gauge pointer will then indicate on the scale the identification number of the tensioning spur wheel which must be substituted for spur wheel "13" to ensure proper functioning of the camera.

A complete set of tensioning spur wheel comprises 13 spur wheel numbered 1 to 13 and having faces at various angles.

If you do not possess the above-mentioned gauge, we will gladly carry out the repair.

Tensioning Ring 528. After replacing the tensioning ring, tensioning and release travel must be checked with gauge LZ 51 1210 022 000. If the gauge shows impermissible deviations, they must be remedied by replacing tensioning spur wheel 523 (see section on Tensioning Spur wheel above). Check engagement of the locking lever.

CN-1210-022
Plate

Bridge 621 with Locking Lever: Simultaneously with the spring-actuated return of the opening pin in blade ring 202, the locking lever must block the return movement of the drive 514. When parts 514 or 621 are replaced, this function must be adjusted by turning the eccentric locking lever pivot 663.

The shutter release timing is adjusted by bending the locking lever lug so that the stop face of the locking lever lug is at least 4.5 mm from the milled portion of the housing.

The diaphragm must have closed to its smallest aperture before the shutter is released.

Engraving strip 714

The orientation of the strip is determined by the fact that it is hooked into the flash terminal. The strip must be in perfect contact with the mount 745.

Insertion of Shutter into Mount 745. Ensure concentricity and planar trueness of shutter. After tightening screws 755, check functioning of preset diaphragm 108 (037), blade opening mechanism 252 and diaphragm closing mechanism 754. 2

Indicator Rings 032 and **034** must be positioned symmetrically to the range indicator mark on the mount 745. 1

Contact points: The contact strip 601 of the shutter must be firmly urged against the nipple 600 of the mount 745, and the contact point must be grease-free and uncorroded. 2

Sleeve 746: Firmly tighten screws 055 and 056. Check functioning of preset diaphragm, blade opening mechanism, diaphragm closing spring and MX-lock. 2

Diaphragm intermediate ring 037 and **diaphragm setting ring 590** as well as **exposure control ring 539** and **slotted cam ring 522** are held in position relative to each other by lugs and grooves. 1

Concentricity and Planar Trueness:

Concentricity: Maximum eccentricity between mount 745 and sleeve 746: 0.015 mm.

Planar Trueness: Maximum wobble between lens seating of mount and lens seating of sleeve: 0.015 mm.

SYNCHRO-COMPUR 0-MXV CN-1210-040/041/042/047

GH Reflex Quick-Change

Cleaning of Shutter:	See Repair Instructions CN–1110–000
Lubricating Instructions:	See Repair Instructions CN–1110–000, also Lubrication Schedules CN–1110–000, CN–1210–022, CN–1210–040 and CN–1210–041
Assembly and Adjustments:	See also Repair Instructions CN–1210–022

	CN–1210–040	CN–1210–041	CN–1210–047
		Plate	
Assembly of Helical Focusing Mechanism CN–1210–040: Screw sleeve 074 into helical focusing nut 018 (Fig. 1) and position the two parts relative to each other as shown in Fig. 2. Screw outer helical focusing ring 073 on to helical focusing nut 018 (Fig. 3) to the position shown in Fig. 4.	2		
In this position the distances between the rings should be as shown in Fig. 5.			
CN–1210–040 In the later version (as of 1965) the clamp ring (049) is added, which is located between the helical focusing nut 018 and the outer ring of the helical focusing mechanism 073 (Fig. 5). For assembly and positions of rings, see above.			
Focusing Tube 075 and **Knurled Sleeve 073:** The positions of these parts relative to each other is fixed by grooves and lugs.		2	
Focusing Tube 075, Sleeve 073 and **Bayonet Plate 001** are fastened to each other in CN–1210–047 by screws 004. Tighten these screws firmly.			1
Threaded Ring 076 must be tightened firmly and must not protrude beyond the knurled sleeve 073.		2	
Telescoping Sleeve 062: Before securing the sleeve 074 or the assembled helical focusing mechanism (Figs. 4 and 5), align the telescoping sleeve as follows:	1 2	2	1
CN–1210–040: With the shutter untensioned, the edge of the outer guide surface of the telescoping sleeve must point to screw 048, if the teeth of the sleeve are in mesh with the pinion for tensioning shaft 060 and the play in the gear train has been taken up in a counterclockwise direction.	1		
CN–1210–041/042/047: With the shutter untensioned, the line connecting the two guide grooves of the telescoping sleeve must point to the corner of the milled recess in the sleeve 074 that is on the tensioning pinion side, if the teeth are in mesh and play in the gear train has been taken up in a clockwise direction.		1	
After replacement of the telescoping sleeve 062, check the tensioning and release travel (see "Bayonet Plate 001", below).			
Sleeve 074: Tighten screws 743 very firmly and secure with varnish.	1	1,2	1
Bayonet Plate 001: Before positioning the bayonet plate, release telescope shaft lock 065 and turn telescope shaft 063 clockwise through 1 – 2° as seen from the inscribed side of the bayonet plate. With the bayonet plate screwed on and gear play taken up (anticlockwise) the tensioning shaft slot must be in the position shown in CN–1210–041, plate 2.	1	2 2	

	Plate CN–1210–040	Plate CN–1210–041
Tighten screws 004 firmly, starting with the one to the right of the red mark.		
After replacing the bayonet plate, the tensioning and release travel must be checked with gauge **LZ 52 1210 702 000.** If the gauge shows impermissible deviations, they must be remedied by replacing tensioning spur gear 523. See section on "Tensioning Spur Gear 523", Type CN–1210–022. For CN–1210–040/041/042/047 use also gauge **LZ 52 1210 702 000.**		
Tensioning Ring 528: Check tensioning and release travel after replacement of this part (see "Bayonet Plate 001", above).		
Focusing Adjustment: To make this adjustment the range scale ring must be removed (see "Range Scale Ring", below).		
Segment 049: Insert this part with the fin on top.		1
Range Scale Ring 027 (028): If it is necessary to remove the range scale ring, it is preferable first to remove the helical focusing assembly from the shutter and then, after removing screw 025 (for CN–1210–040) or the three set screws 025 (CN–1210–041/042/047), to take off the range scale ring.	1 1	1 1
In type CN–1210–040 proper positioning of the range scale ring is ensured by design features. In types CN–1210–041/042/047 the ring must be set at ∞ (infinity) while up against the stop and then fastened with the screws 025.		1
Locking Screw 031: Before positioning the range scale ring 026, align locking screw 031 so that when the slotted nut 023 is tightened the point of the locking head swings to the middle of the range scale ring	1	
In the later version (as of 1965), the complete helical focusing mechanism 073 is mounted on the focusing ring 026 with the aid of the fillister head screws 031 and the clamp ring 049.		
Range Setting Ring 026: After completing the focusing adjustment, range setting ring 026 must be set at ∞ (infinity) with the locking screws 031 slackened or (in CN–1210–041/042/047) with the segments loosened and without changing the setting of the helical focusing assembly. This is facilitated by a limit stop which in CN–1210–040 (Plate 2, Fig. 6) comprises a pin and milled abutment, and in CN–1210–041/042/047 a stop plate 024 and screw 115.	1 2	1
Retighten screws 031 and 056 (CN–1210–041/042/047) firmly.		

Concentricity and Planar Trueness:

Concentricity:	Maximum eccentricity between mount 745 and sleeve 746: 0.015 mm.
Planar Trueness:	Maximum wobble between bayonet seating (001) and lens seating of mount 745: 0.04 mm.
	Maximum wobble between mount 745 and lens seating of sleeve 746: 0.015 mm.

SYNCHRO-COMPUR 00-MXV STANDARD CN-1110-016

with light value follow-up system and automatic depth of field indicator

Cleaning of shutter:	as under CN—1110—000
Lubricating instructions: see also lubricating schedules	as under CN—1110—000 CN—1110—000 and 1110—016/018
Assembly and adjustments:	see also Plates CN—1110—000 and CN—1110—010

Tensioning pinion, tensioning ring and **drive:** as under point 3, adjustment type "B".

	Plate CN-1110-016	Plate CN-1110-018
Diaphragm setting ring 590, diaphragm intermediate ring 037 and **diaphragm ring 108** are rigidly fixed to each other by grooves and lugs. The diaphragm setting ring should lie in springy contact with the shutter speed coupling ring (Spring 173).	1	1
Shutter speed coupling ring 163, slotted cam ring 552 and **shutter cam ring 184** are fixed relative to each other by grooves and lugs.	1	
Indicator rings 032 and **034** are positioned symmetrically to the range indicator.	1	1
Rocker 040 is carried on the rocker pivot of the diaphragm intermediate ring 037, its long pin lying in the guide groove of the STA-housing 808. The short pin engages in the slot of the indicator ring 032.		1
STA-housing 808 — before mounting the complete assembled housing on the shutter, check the operation of the indicator mechanism at the lug of the diaphragm intermediate ring 037.		1
Insert click stop ball generously greased with lubricant A.		
Shutter speed coupling ring 163: Movement and stop engagement must be adjusted by tightening screw-on ring 547 just sufficiently to permit smooth travel of the slotted cam ring 552 and effective stop engagement. The vertical play of the shutter speed coupling ring 163 between the shutter housing 101 and STA-housing 808 should not exceed 0.2 mm. If necessary, adjust the ball stop spring. When properly adjusted, the screw-on ring should be secured with the retaining screw 538 at the nearest possible point.	1	1
Light value stem 192 is the coupling member between the shutter and the camera. It must be so carefully set that error-free indication of light values is ensured.	1	
For inserting the light value stem, the mechanism must be set at light value 9, that is, the shutter and the exposure meter follower pointer with the camera coupling member must be set at 9. The sliding surfaces of the rivets on the stem must lie on the two cams (Diaphragm ring 108 and shutter cam ring 184) in all possible settings.	1	

The pointer position must alter with every change in f-stop or shutter speed setting. If shutter speed and f-stop (light value) are changed simultaneously, the setting of the follower pointer should remain unchanged.

Items 2 to 11 as under CN—1110—000.

SYNCHRO-COMPUR 00-MXV STANDARD CN-1110-018

with automatic depth of field indicator

Cleaning of shutter:	as under CN–1110–000
Lubricating instructions: see also lubricating schedules	as under CN–1110–000 CN–1110–000 and CN–1110–016/018
Assembly and adjustments:	see also Plates CN–1110–000 and CN–1110–010

CN–1110–018
Plate

Tensioning pinion, tensioning ring and **drive:** as under CN–1110–000, point 3, adjustment type "B".

Exposure control ring 539, shutter speed coupling ring 163 and **slotted cam ring 552** are fixed relative to each other by grooves and lugs.

Diaphragm setting ring 590, diaphragm intermediate ring 037 and **diaphragm ring 108** are fixed relative to each other by grooves and lugs. 1

Indicator rings 032 and **034** are positioned symmetrically to the range indicator. 1

Rocker 040 is supported on the rocker pivot of the diaphragm intermediate ring 037, its long pin lying in the guideway of the STA-housing 808. The short pin engages in the slot of indicator ring 032. 1

STA-housing 808 — before mounting the complete assembled shutter housing, check the operation of the indicator mechanism at the lug of the diaphragm intermediate ring 037. 1

Insert click stop ball generously greased with lubricant A.

Exposure control ring 539: Movement and **stop engagement** must be adjusted by tightening screw-on ring 547 just sufficiently to permit smooth travel of the slotted cam ring 552 and effective stop engagement. The vertical play of the exposure control ring 539 between shutter housing 101 and STA-housing 808 should not exceed 0.2 mm. If necessary, adjust the ball stop spring. When properly adjusted, the screw-on ring should be secured with the retaining screw 538 at the nearest possible point.

Items 2 to 11 as under CN–1110–000.

SYNCHRO-COMPUR 00-MXV Bayonet Sleeve Reflex CN-1110-024

with light-value follow-up system

Cleaning of shutter

It is imperative to remove parts or assemblies from the shutter for cleaning, which should be done by rinsing them in clean, grease-free trichloroethylene or perchloroethylene. Escapement and selftimer mechanisms should not be disassembled for cleaning.

Before reinstalling parts in the shutter, be sure they are completely dry and regreased in accordance with the lubricating instructions. Parts with a grey lustre must not be rubbed dry with a cloth.

Lacquered parts or parts coated with grey anti-friction lacquer, knobs of plastics, and parts with filled engravings or mounted f-scales should never be wet-cleaned. Use a soft chamois leather or brush.

Lubricating instructions: as under CN–1110–000

See also lubrication schedules CN–1110–000 and CN–1110–024

Assembly and Adjustments CN–1110–024 Plate

Tensioning Pinion, tensioning ring and **drive:** as under CN–1110–000, point 3, adjustment type "B".

Exposure control ring 539: Proper movement and **stop engagement** are ensured by the design. After replacing bayonet retaining ring 730, it may be necessary to adjust the stop ball spring so that the exposure control ring moves smoothly and the slotted cam ring 552 engages in the stops effectively. 2 & 3

Blades 208 and **267** and their bearings should be completely free from grease. The order of insertion is indicated in the illustration by the small numerals 1 to 5. The fifth blade 267 has a recess to accommodate the tensioning shaft. 3

Bayonet retaining ring 730, exposure control ring 539 and flanges ring 815: When replacing any of these parts, the vertical play of the exposure control ring must be checked. It should lie between 0.03 mm. and 0.08 mm. If there is too little play, the guide surface for the exposure control ring on the bayonet retaining ring must be machined down (turned) to size. If there is too much play, the bayonet retaining ring must be replaced. 2

Then the following truing operations must be carried out on the bayonet retaining ring:

(a) Vertical play (as described above)

(b) For interchangeable front components, the distance between the face of the tube and the lens seating of the bayonet retaining ring is 3.0 — 0.02 mm. Truing is carried out by turning out the lens seating of the bayonet ring while it is firmly screwed into the shutter (for checking see "Concentricity and Planar Trueness Test").

CN–1110–024
Plate

During truing special care must be taken to ensure that no chips reach the blades or the inside of the shutter (cover carefully).

If you are unable to do the turning work yourself, we will gladly carry out the repair. In such case, please send us the entire shutter.

Diaphragm opening ring 761 and **reversing pinion 757:** When inserting the pinion, the third tooth — from the left — of the opening ring must point to the centre of the shutter and to the marking on the reversing pinion. This marking is engraved in the gap between two teeth of the reversing pinion (lower illustration, arrow). 2

Diaphragm ring 108 and **blade cover 116** are fixed relative to each other by a groove and pin. 2 & 3

Coupling 722 is pressed on to the tensioning pinion, without jamming the rings, after positioning the diaphragm intermediate ring 037 in the above-described open position. If the shutter front is also open, the tensioning pinion must be supported when the tensioning pinion is pressed on. Check smooth operation of gears and rings. 2

Diaphragm setting ring 590 and **diaphragm intermediate ring 037** are fixed relative to each other by a groove and lug. 2

Idler gear 820 is placed on the shaft with the depression towards the adjusting plate 818 (shutter mount 745). Check movement with light value stem 192 and grease generously with Lubricant A. 1

Assembly of light value mechanism

Before disassembling the light value mechanism, it is advisable to mark the position of the light value stem 192 for settings of „B“ and f/22. 1

(a) For repair the shutter is opened at the front (outer cover ring 738, bayonet retaining ring 730 and exposure control ring 539 removed). 2

With the aperture set at f/22, flanged ring **815** must be turned so that the axis of the wheel lies over the centre of the MX setting ring lock lever 747 (lower illustration). 1

Insert exposure control ring **539** with cam ring **552** in position "B". The exposure control ring and cam ring are fixed relative to each other by a groove and lug. 2 & 3

Cover plate **540:** The recess must be in the vicinity of the click stop ball. 2

CN-1110-024
Plate

Bayonet retaining ring 730 with ball stop (heavily greased with lubricant A) are inserted in position "B" and firmly fastened with screws **743.** 2

Check: It should be possible to set both extreme aperture values and, after releasing the shutter, the diaphragm should automatically set itself to any preselected stop before the blades open.

(b) Repair effected from the rear of the shutter.

Before re-assembling the light-value mechanism, cover plates **540** and exposure control ring **539** should be removed. 2

Before inserting the shutter in shutter mount 745 the light value stem **192** should be turned to the previously marked position and the diaphragm set to f/22 with diaphragm setting ring **590** and firmly held there. 1 u 2

When positioning the shutter mount, the setting ring lock **747** should be kept swung out, tensioning shaft and light-value stem should be turned until the pinions engage and the shutter mount is seated firmly on the housing. 1

Fasten with screws **753.** 1

Check: It should be possible to tension and release the shutter without hindrance; check position of light-value stem. It should be possible to set the largest and smallest apertures (with diaphragm setting ring 590).
Further assembly of the light-value mechanism as under (a).

Adjustment of the light-value mechanism: 1 u 2
After replacing one of the parts of the light-value mechanism (539, 815, 590, 745), the light-value stem 192, or the idler gear 820, the reverse play and the toothed pinion engagement of the completely assembled shutter should be checked.
The reverse play of exposure control ring 539 to diaphragm setting ring 590 and the engagement of the teeth can be adjusted by shifting the adjustment plate **818.** 1

For this purpose, loosen screw 831 and shift eccentric screw **825.** 1

Screw 831 should be retightened after adjustment.

Indicator rings 032 and **034** are placed symmetrically to the range setting indicator.

Rocker 040 is supported on the pivot of the diaphragm intermediate ring 037 and its long pin runs in the guide groove of the mount body 020. The small pin engages in the slot in the indicator ring 032. 1 u 2

Concentricity and Planar Trueness Test

Concentricity: Maximum eccentricity between housing and mounting tube: 0.01 mm. (Always measure at mount sleeve).

Maximum eccentricity between lens centering (housing and mounting tube) and camera centering (shutter mount 745: centering diameter 46.0 mm): 0.03 mm.

Planar trueness: Maximum wobble between camera seating surfaces (housing, tube and bayonet retaining ring): 0.01 mm.

Maximum wobble between lens seating surface and camera seating surface on shutter: 0.02 mm.

Points 2 to 11 unchanged as for CN–1110–000.

SYNCHRO-COMPUR 00-MXV Standard CN-1110-025 and CN-1110-019

with light-value follow-up system

Cleaning of shutter as under CN–1110–000

Lubrication instructions as under CN–1110–000
See Lubricating Charts CN–1110–000 and CN–1110–025/026

Assembly and adjustments

CN–1110–019 CN–1110–025
Plate

Tensioning pinion, tensioning ring and **drive:** as under CN–1110–000, point 3, adjustment "B".

Exposure control ring 539: Smooth action and proper functioning of **stops** are ensured by the design. After replacing the cover plate, it may be necessary to adjust the ball stop spring so that with smooth travel of the exposure control ring the slotted cam ring 552 (shown in Plate 3, CN–1110–024) engages efficiently. 1 1

Cover plate 540, exposure control ring 539 and **flanged intermediate ring 815:** When replacing one of these parts, the vertical play of the exposure control ring must be checked. It should be between 0.03 mm and 0.08 mm. If there is too little play, the planar guide surface for the exposure control ring on the cover plate must be machined down. If there is too much play, the cover plate must also be replaced and, if necessary, the adjustment above carried out. 1 1

Assembly of the light-value mechanism: 1 1
(a) Repair from the front end of the shutter. (Cover plate 540 and exposure control ring 539 are removed, but not retaining plate 174).

Diaphragm setting ring **590** with diaphragm ring **108** and flanged intermediate ring **815** are turned in anti-clockwise direction to the stop (i. e. largest aperture). Exposure control ring 539 with slotted cam ring 552 — fastened by groove and lug — are placed at setting "B"; the flanged intermediate ring must not be shifted from its position during this operation.

Cover plate 540, with ball stop inserted (heavily greased with lubricant A), is then mounted and firmly fastened with screws 004.

(b) When effecting repair from the rear of the shutter retaining plate 174, diaphragm setting ring 590 and flanged intermediate ring 815 are removed, but not the cover plate).

Exposure control ring **539** with slotted cam ring 552 is inserted at setting "B".

CN–1110–019 CN–1110–025
Plate

Flanged intermediate ring **815** is so mounted that one edge of the recess is aligned with one edge of the housing groove, as in illustration plate CN–1110–019, lower illustration arrows.
When positioning setting ring **148**, ensure that the shutter speed lever spring 673 (= setting ring spring, see illustration plate CN–1110–016, lower illustration) contacts the setting ring pin on the correct side.

Set the diaphragm to the smallest aperture with diaphragm ring **108** (up against stop) and mount the diaphragm setting ring. Fastened by groove and lug. Retaining plate **174** should be screwed on with the MX locking lever swung out. 1 1

Check: At settings "B" and "500", it should be possible to set both the largest and the smallest aperture.

Points 2 to 11 unchanged as for CN–1110–000

SYNCHRO-COMPUR 00-MXV Standard CN-1110-026

with light-value follow-up system and automatic depth of field indicator for front lens adjustments

Cleaning of shutter	as under CN–1110–000
Lubrication instructions	as under CN–1110–000 See lubricating charts CN–1110–000 and CN–1110–025/026
Assembly and adjustments	
	See illustration plates CN–1110–000 and CN–1110–025

Tensioning pinion, tensioning ring and **drive:** as under CN–1110–000, point 3, adjustment "B".

Exposure control ring 539: Smooth action and proper functioning of stops are ensured by the design. After replacing the STA-housing 808, it may be necessary to adjust the ball stop spring so that with smooth travel of the exposure control ring the slotted cam ring 552 engages efficiently. 1

STA-housing 808, exposure control ring 539 and **flanged intermediate ring 815:** When replacing one of these parts, the vertical play of the exposure control ring must be checked. It should be between 0.03 mm and 0.08 mm. If there is too little play, the guide surface for the exposure control ring on the STA-housing should be machined down. If there is too much play, the STA-housing must also be replaced and, if necessary, the above adjustment carried out. 1

If you are unable to do the turning work yourself, we will gladly carry out the repair for you. In such case please send us the entire shutter, or the STA-housing alone with exact specifications of how much metal is to be removed.

CN-1110-026
Plate

Indicator rings 032 and **034** are positioned symmetrically to the range setting indicator on the STA housing. 1

Rocker 040 is carried on the pivot of the intermediate diaphragm ring 037 and its long pin runs in the cam of the STA-housing 808. The small pin engages in the slot in the indicator ring 032. 1

Assembly of light-value mechanism:

(a) Repair with the front of the shutter open. 1
(STA-housing 808 and exposure control ring 539 removed, but not retaining plate 174).

Diaphragm setting ring **590** with diaphragm ring **108** and flanged intermediate ring **815** are turned anti-clockwise to the stop (i. e. largest aperture). Exposure control ring 539 with slotted cam ring 552 — fixed by groove and lug — is positioned at **setting "B".** Care should be taken not to displace the flanged intermediate ring.

Before mounting the complete assembled housing on the shutter, STA-Housing **808** should be checked at the lug of the intermediate diaphragm ring 037 for smooth action of the indicator mechanism and the ball stop inserted (heavily greased with lubricant A). 1

Then firmly screw the housing into position with threaded ring 547 and fasten at the nearest possible point with retaining screw 538. Intermediate diaphragm ring **037** and diaphragm setting ring 590 are fastened to each other by spline and lug 579. 1

(b) Repair from the rear end of the shutter. (Retaining plate 174, diaphragm setting ring 590 and flanged intermediate ring 815 removed, but not the STA-housing.)

Exposure control ring **539** with slotted cam ring **552** is positioned at setting "B".

Insert flanged intermediate ring **815** so that one edge of the recess is aligned with one edge of the housing groove, as shown in Illustration Plate CN—1110—016, lower illustration, arrows

When mounting setting ring **148**, ensure that the shutter speed lever spring 673 ([illegible] setting ring spring, see illustration plate 1110—016, bottom) contacts the setting ring pin on the correct side. Set the diaphragm ring **108**(to limit stop) and position the diaphragm setting ring. Fastened by groove and lug.

Screw on retaining plate **174** firmly, with the MX locking lever swung out.

Check: With settings "B" and "1/500 sec.", it should be possible to set both the smallest and the largest aperture with diaphragm setting ring 590. Both depth-of-field indicators should rotate from stop to stop.

Points 2 to 11 unchanged as for CN—1110—000.

SYNCHRO-COMPUR 00-MXV Wide Angle CN-1110-034
with Light-Value Follow-up System

		CN-1110-034 Plate
Cleaning of shutter	As under CN—1110—000	
Lubricating instructions	As under CN—1110—000 See Lubricating Charts CN—1110—000 and CN—1110—034/035	

Assembly and adjustments

Exposure control ring 539: Smooth action and proper functioning of stop are ensured by the design. After replacing the bayonet retaining ring 730, it may be necessary to adjust the ball stop spring so that with smooth travel of the setting ring the slotted cam ring 552 is engaged efficiently. 1

Tensioning pinion, tensioning ring and **drive:** as under CN—1110—000, point 3, adjustment "B".

Blades 208, 267 and **268** and their bearings must be completely free from grease. The sequence of insertion is indicated by the small numerals 1 to 6 in the illustration. The second blade 267 is recessed in the vicinity of the tensioning shaft. 2

Cover blade 268 is the sixth to be mounted on the pivot of the first blade so that the fifth blade lies between the first and sixth.

Synchronization:

Minimum distance between contacts with shutter tensioned = 0.3 mm. (measured at M setting).

X contact closes, when the blade points lie between a circle of 21.5 mm diameter and full shutter aperture.

Pre-ignition delay and contact pressure as under CN—1110—000.

Bayonet retaining ring 730, exposure control ring 539 and **outer cover ring 738:** When replacing any of these parts, the vertical play of the exposure control ring must be checked. It should be between 0.03 mm and 0.08 mm. If this is not the case, the play should be adjusted with the three screws **822.** 1

The light value stem 192 should be easily rotatable. Before mounting the bayonet retaining ring, back off the supporting screw 545 (a set screw with pin) and insert cover plate 540 and the ball stop (heavily greased with lubricant A). 1

Set slotted cam ring to setting "B". (CN—1110—035, Plate 3, Fig. 3, arrow).

Assembly of bayonet plate and casing should be carried out as shown in Fig. 3, CN—1110—035, Plate 3. These two parts are fixed relative to each other by groove and lug.

First, lightly fasten bayonet retaining ring with screws **743**, insert the supporting screw **545** (the head should not protrude), and then tighten the screws 743. 1

Light value stem 192 should be inserted into the housing so that at setting "B" an imaginary central line parallel to the key surface points at screws 612 (lower illustration). 1 & 2

CN-1110-034
Plate

Assembly of light value mechanism: 1
Diaphragm setting ring **590** – actuated by spring **824** – should automatically turn to the stop for the largest aperture (CN–1110–035, Plate 3, Fig. 2).

Flanged intermediate ring **815** must be slipped on to the outer cover ring **738** so that the edge of the flanged intermediate ring is aligned with the edge of a groove of the outer cover ring (1110–035, Plate 3, Fig. 4, arrow). 1

Exposure control ring **539** and slotted cam ring **552** are fixed relative to each other by groove and lug. (CN–1110–035, Plate 3, Fig. 4, arrow.) The exposure control ring should be at setting "B". Insert light value stem. 1

Mount the outer cover ring with the above-mentioned settings (CN–1110–035, Plate 3, Fig. 4). 1

Adjustment of light value mechanism:
After replacing any of the parts of the light value mechanism (815, 818, 820) or the light value stem **192**, and also after loosening and displacing the adjustment plate **818**, tooth engagement and reverse play of the light value stem 192, idler gear 820 and flanged intermediate ring 815 must be checked. 1 u 2

There are two versions of the adjustment plate bar **818**, and consequently two methods of adjustment.

(a) Shutter with adjustment plate 1110 10 034 818 **80**: (Shape as shown in illustration plates).

After slackening the two screws 260, the adjustment plate 818 should be shifted with both screws so that the idler gear 820 engages without play in both the flanged intermediate 815 and the light value stem 192.

After adjustment, retighten the screws 260. The light value stem 192 should still be easily rotatable.

(b) Shutter with adjustment plate 1110 10 034 818 **81**: (Not illustrated, instead of the recess in 818 80, 818 81 has an eye with an aligning collar for the shaft. The aligning collar fits into the housing).

Play between the teeth of the light value stem 192 and the idler gear 820 should be kept as small as possible. For this purpose, a set of idler gears (3 different sizes) is available, from which the suitable size should be selected.

By shifting the slackened adjustment plate, idler gear and flanged intermediate ring positions can be adjusted to eliminate play.

After adjustment, retighten screws 260. The light value stem should be easily rotatable.

Check: It should be possible to set any combination of aperture and shutter speed with the light value stem 192 (1/500 and smallest aperture to "B" and largest aperture.)

Concentricity and planar trueness test 1
Concentricity: Maximum eccentricity between bayonet retaining ring 730 (centering diameter for quick-change mount) and outer cover ring 738 (internal diameter): 0.07 mm.

Planar trueness: Maximum wobble between bayonet retaining ring 730 and camera seating: 0.02 mm.

Points 2 to 7, 9 and 11 unchanged as for CN–1110–000.

SYNCHRO-COMPUR 00-MXV Wide-Reflex CN-1110-035
with Light Value Follow-up System

Cleaning of shutter	As under CN–1110–000
Lubricating instructions	As under CN–1110–000 See lubricating charts CN–1110–000 and CN–1110–034/35
Assembly and adjustments	See illustration plates CN–1110–000

CN-1110-035 Plate

Exposure control ring 539: Smooth action and proper functioning of the stops are ensured by the design. After replacing bayonet retaining ring 730, it may be necessary to adjust the ball stop spring so that with smooth travel of the setting ring the slotted cam ring 552 engages efficiently. 1 u. 2

Tensioning pinion, tensioning ring and **drive:** as under CN–1110–000, point 3, adjustment "B". 1

The tensioning pinion should be inserted so that the first tensioning ring tooth engages in the first tooth space of the pinion (see lower illustration). 2

Bridge 621 with **locking lever** and **intermediate lever:** 1
When the opening pin in the blade ring 202 (lower illustration) springs back, the locking lever should simultaneously block the return action of the drive 514. This movement will not require adjustment even when parts have been replaced.

When replacing bridge 621 or tensioning ring 528, the shutter release must be checked. If necessary, the adjustment member of the locking lever must be bent so that the tensioning ring, shortly before reaching its rest position, swings the locking lever out so far that the latter reliably frees the drive.

The trip member of the intermediate lever must lie in front of the lug of the M-cam check lever 696. When tensioned — with M setting — the intermediate lever must swing the M-cam check lever out

Blades 208, 267 and **268** and their bearings must be completely free from grease. The sequence of insertion can be seen in the illustration, marked by small numerals 1 to 6. The second segment 267 is recessed in the vicinity of the tensioning shaft. 2

Cover blade 268 is the sixth to be placed on the pivot of the first blade, so that the fifth lies between the first and the sixth segment.

Tensioning ring lock 569: After replacing this part, the tensioning ring release should be checked with the entire camera. If necessary, adjustments can made to the lug of part 569. 2

Minimum contact gap with shutter tensioned = 0.3 mm
(measured with M setting)

X contact closes when the blade points lie between a circle of 21.5 mm diameter and full shutter opening.

Pre-ignition delay and contact pressure as under CN–1110–000.

CN-1110-035
Plate

Opening Disk 801, Pawl 802 and **Blade Ring 202:** 2

The rear pin of the segment should push the pawl back approx. 0.1 mm when the shutter is tensioned. When replacing any of the parts 801, 802 or 202, this function should be checked and, if necessary, the opening pin bent as required.

When the bayonet retaining ring has been removed, the tensioning pinion 517 should be supported when pressing the opening disk into place.

Bayonet retaining ring 730, exposure control ring 539 and **outer cover ring 738:** 1

When replacing any of these parts, the vertical play of the setting ring should be checked. It should lie between 0.03 mm and 0.08 mm. If this is not the case, the play must be adjusted with the screws 822.

The light value stem 192 should be easily rotatable.

Before assembling the bayonet retaining ring, supporting screw **545** (a set screw with
pin) should be backed off and the cover plate **540** and ball stop (2.0 mm diameter)
positioned (heavily greased with lubricant A). Set the slotted cam ring at Setting "B". 2 u. 3
(Fig. 3, arrow).

Bayonet retaining ring 730 and housing are placed together as shown in Fig. 3. These two parts are fastened to each other by groove and lug. 2 u. 3

First, lightly fasten retaining ring with screws **743,** screw in the supporting screw 545 (the head should not protrude), then tighten screws **743.**

Light value stem 192 should be inserted into the housing so that at setting "B" an imaginary line parallel to the key surface points to screw 612 (lower illustration, Plate 2). 1 u. 2

Assembly of the light value mechanism:
The spring **824** should turn diaphragm setting ring **590** automatically to the largest aperture (Plate 3, Fig. 2). 1 u. 3

Flanged intermediate ring 815 should be attached to the outer cover ring **738** so that the 1 u 3
edge of the flanged ring is aligned with a groove edge on the outer cover ring (Plate 3,
Fig. 4, arrow). Diaphragm opening ring **761** should so be attached to the outer cover 1 u. 3
ring **738** that the third tooth points to the shaft of the pinion. (Plate 3, Fig. 4, arrow).

Exposure control ring **539** and slotted cam ring **552** are fixed relative to each other by 1 u. 3
groove and lug (Plate 3, Fig. 4, arrow). Set exposure control ring at setting "B".
Insert light value stem.
The outer cover ring should be mounted with all settings as described above; in the 3
process, the tensioning pinion should be slightly turned until the idler gear (at the outer
cover ring) meshes with the teeth of the tensioning ring (Plate 3, Fig. 4).

CN-1110-035
Plate

Adjustment of light value mechanism:

After replacing any components of the light value mechanism (815, 818, 820) or the light value stem 192, and also when the adjustment plate **818** has been slackened and displaced, tooth engagement and reversal play of the light value stem, idler gear and flanged intermediate ring should be checked. Two versions of adjustment plate **818** are available, and hence there are two methods of adjustment. 1

(a) Shutter with adjustment plate 1110 10 034 818 **80:** (Shape as shown in the illustration plates).

After loosening the two screws 260, the adjustment plate 818 with these screws is so shifted that the idler gear 820 engages without play in both the flanged intermediate ring 815 and the stem 192.

After adjustment, firmly retighten the screws 260. The light value stem 192 should be easily rotatable.

(b) Shutter with adjustment plate 1110 10 034 818 **81:** (Shape not shown. Instead of the recess for the shaft as in style 818 80, the 818 81 version has an eye with aligning collar which fits into the housing.)

The play between the teeth of the light value stem 192 and those of the idler gear 820 should be as small as possible. For this purpose, a set of idler gears is available (3 different sizes) from which the most suitable should be selected.

By shifting the adjustment plate, idler gear and flanged intermediate ring are adjusted to eliminate all play.

After adjustment, firmly retighten the screws 260. The light value shaft should be easily rotatable.

Check: With the light value stem 192 it should be possible to set all combinations of aperture and shutter speed (from 1/500 and smallest aperture to "B" and largest aperture).

With the Compur Quick-Qhange Mount in position and the shutter tensioned, the blades and diaphragm should clear the light-entry aperture and remain in this open position (regardless of the aperture set). On triggering the release, the diaphragm must spring to any pre-set f-stop before the blades open.

Concentricity and Planar Trueness Test

Concentricity: Maximum eccentricity between bayonet retaining ring 730 (centering diameter for quick-change mount) and the outer cover ring 738 (internal diameter): 0.07 mm. 1

Planar Trueness: Bayonet retaining ring 730: Quick-change mount seating to camera seating surface: Maximum wobble 0.02 mm.

Points 2 to 7, 9 and 10 unchanged as for CN–1110–000.

COMPUR-RAPID 00-XV CN-1112-004

with light value follow-up system — thrust cam differential

Cleaning of shutter: as under CN—1110—000

Lubricating instructions: as under CN—1110—000
See also lubrication schedules CN—1110—000 and CN—1112—004

Assembly and adjustments:
Repair instructions CN—1110—000, points 2, 5, 6 and 10 unchanged.

Exposure control ring 539: Proper functioning of the stops is ensured by the design The exposure control ring and the film speed ring **576** must be held firmly against the housing 101 by the spring. If necessary, the spring ring **574** must be appropriately pretensioned. Fasten the spring ring with stud screw **571.** CN 1112 004 Plate 1

Tensioning wheel 517 and **drive 514** govern movement when the shutter is tensioned and released. If one of these parts is replaced, proper functioning must be checked in conjunction with the camera. If necessary, the lugs of the tensioning wheels should be machined down or bent slightly (CN—1110—000, plate 2).

Blade ring 202 and stop 299. If one of these parts is replaced, the check lever adjustment must be checked and reset by turning the eccentric screw 663 of the check lever 696 so that when the shutter is run down there is a gap of 0.02 to 0.2 mm. between the check lever tooth and the blade ring.

Synchronisation

Gap between contacts with shutter tensioned: 1.1 to 1.3 mm. The X-contact lever must lie up against the blade ring.

Diaphragm setting ring 590: The wedge-shaped thrust cam **185** and the diaphragm ring **108** are seated in the diaphragm setting ring. The setting ring must be held firmly against the housing by the spring; if necessary, the **retaining plate 174** must be pretensioned. Fasten the retaining plate firmly with screws **261.** 1

Concentricity and planar trueness are ensured by design features.

SYNCHRO-COMPUR 0-MXV CN-1210-051

with blade opening mechanism

Cleaning of shutter: as under CN–1110–000

Lubricating instructions: as under CN–1110–000
See also lubrication schedule CN–1110–000
The plastics knobs **509** on the tensioning ring and **118** on the diaphragm ring must not be cleaned with trichlorethylene or perchlorethylene.

Assembly and adjustments: With the shutter untensioned, the **blade opening lever 262** must, when in the "closed" position, lock the blade opening ring **252.** The lock spring for the blade opening lever must be tensioned so that on the one hand its engagement can be clearly felt, but on the other hand does not hinder the blade opening process when the tensioned, opened shutter is released.

CN-1210-051
Plate
1

Concentricity and planar trueness:

Concentricity: Maximum eccentricity between mounting tube 204 and casing 101: 0.015 mm.

Planar trueness: Maximum wobble between lens seating of mounting tube and lens seating of housing: 0.015 mm.
Maximum wobble between shutter housing camera seating and housing lens seating: 0.02 mm.

COMPUR 000-X CN-1914-000

Cleaning of Shutter

It is imperative to remove parts from the shutter for cleaning. **Wet** cleaning should be done by rinsing in clean, greasefree trichloroethylene or perchloroethylene, and **dry** cleaning with soft chamois, a hand brush or hair brush.

When cleaning parts partially coated with anti-friction lacquer (green or black), special care should be taken not to damage the lacquer. The diaphragm should preferably be cleaned dry, without disassembling it. If wet-cleaning of the diaphragm is necessary, it should be removed from the shutter first. Wet-cleaning of plastic parts must be done quickly. They must not be allowed to lie in the cleaner. Before reinstalling cleaned parts in the shutter, they should be dried thoroughly and regreased in accordance with the lubricating instructions and lubrication schedule.

Lubricating Instructions

The required lubricant (A) and PDP 38 oil can be obtained from us. Other lubricants should not be used, since only those tested by us guarantee reliable functioning.

The prescribed lubricant should be spread on a sheet of glass, picked up with a hair brush or foam rubber swab, and then carefully applied to the lubrication point. Furthermore, the lubricant must be stirred well before use.

For lubricating escapement parts, use a mixture of three parts white spirit to one part PDP 38 oil **(marked red in Lubrication Schedule).**

Shake well before use.

The previously cleaned parts should be dipped in this mixture and then left on clean blotting paper until the mixture has run off properly. The remaining film of oil is sufficient for lubrication. Any drops remaining in holes or at the base of teeth must be removed (blown out). The lubricating points and lubricants are indicated in Lubrication Schedule CN-1914-000.

Assembly and Adjustments

1 The **blades 208** and their bearings must be completely free from grease. The small numerals 1 to 3 in the illustration indicate the order of assembly. The blades should be preferably installed with the shutter in the "closed position". CN-1914-000 Plate 3

2. The **diaphragm segments 105** and their bearings must be completely free from grease. 4
To assemble the diaphragm, proceed as follows:
   - (a) The **blade cover 116** should preferably be laid diaphragm-side up on a support (approx. 1 in. diam.) Plate 4
   - (b) Position diaphragm segments **105** in the "open setting". For order of installation see Fig. 1. The diaphragm segments are movably seated in the blade cover 116.
   - (c) Position diaphragm cover **106** so that the guide pins of the diaphragm segments engage in the cams.
   - (d) Mount casing **101**. Casing and blade cover are fastened to each other by a pin and hole.
   - (e) Reverse casing with mounted diaphragm and fasten firmly with screws **117.**
   - (f) Check smooth diaphragm movement.

3 **Locking lever 661.** If the drive **514** or locking lever needs replacing, check engagement of the locking lever. 1 & 2
The locking lever must engage simultaneously with the thrust pawl (514) or a little later (0° to 1°30, measured at the cocking shaft).
If this is not the case, select another locking lever from the assortment. Locking levers of 6 different lengths are available (see also Supplement No. 90).

4. Synchronization

Contact gap: approx. 1.0 mm (see Fig. 2) CN-1914-000
Contact pressure: min. 35 p (see Fig. 3) 2
For synchronization the blade ring **202** must be kept in the "open" position. The contact spring **606** must also be so adjusted that contact is made when the blade tips are open to full aperture.

5. Escapement Group

The lubrication of the escapement parts is described in the lubricating instructions. When assembling the escapement, proceed as follows:

(a) Insert detent pin **305,** detent wheel **310** and intermediate gear **322.** 1

(b) Press eccentric **352** on to the detent shaft **357.** In so doing, place the eccentric in the middle position (see Fig. 2). The torque of the eccentric must exceed 100cmp, to prevent subsequent disadjustment. 1 & 3

(c) Swing detent pin in to the mounting tube (Fig. 2). 1

(d) Turn intermediate gear 322 90° to 120° in an anticlockwise direction and hold it (the recuperating spring lies against the mounting tube and is tensioned by this movement). It is advisable to mark the position of the recuperating spring with the detent pin swung inwards before disassembling the mechanism. Do not change the anchoring of the spring on the wheel. Plate

(e) Insert the completely assembled weight (Fig. 1). The weight **345** and pinion **347** must be easily movable relative to each other so that the weight springs back into its initial position under pressure from the weight spring **359.** 1

(f) Check smooth operation of escapement by swinging the detent pin. The detent pin must automatically swing back against the edge of the casing under pressure from the recuperating spring.

Escapement Adjustment: The position of the slotted cam ring for various shutter speeds is indicated in Fig. 3. If the shutter under repair is fitted with a click-stop shutter speed setting ring, adjustments should be made with the stop engaged. 1

1/30 s, 1/60 s:
If the escapement is assembled in compliance with the foregoing instructions, these two speeds are generally within the specified tolerances
Coarse adjustment: By altering the pre-tensioning of the recuperating spring (change spring anchoring, Fig. 2).
Fine adjustment: By means of the eccentric (Fig. 3).

1/125 s: Coarse adjustment: By bending the slotted cam ring flange.
Fine adjustment: By readjusting the eccentric.

1/500 s: By bending the shutter speed cam lug.

Shutter speeds: Measurements should be made with the slotted cam ring set and locked

Rated speed	30	60	125	250	500	1/s
ta* — lower limit	28.0	14.4	7.66	4.43	2.63	ms
ta* — ideal	32.3	16.63	8.81	4.91	2.95	ms
ta* — upper limit	37.3	19.21	10.14	5.92	3.51	ms

6. Concentricity and Planar Trueness

Concentricity: Maximum eccentricity between rear lens centering (casing) and front lens centering: 0.01 mm
Planar Trueness: Maximum wobble between camera mounting surface and lens mounting surface: 0.015 mm
Maximum wobble rear lens mounting surface and front lens mounting surface: 0.01 mm

* ta = axial time (measured through middle of shutter, light pencil diam. 0.5 mm)

CN-1914 000

Plate

e) Insert the fully assembled weight (Fig. 1). Weight **345** and pinion **347** must be easily rotatable in relation to each other, so that the weight will snap back to its initial position under the effect of the weight spring **359.** 1

f) Check escapement for smooth operation by swinging out the detent which must be pulled against the edge of the housing by the force of the return spring.

Adjustment of escapement: The positions of the cam ring corresponding to several shutter speeds are indicated in Fig. 3. If the shutter to be repaired is provided with a speed selector ring with click stops, the adjustment must be made in a click-stop position. 1

1/30 sec, 1/60 sec:

When the escapement has been assembled as described above, these two speeds are generally within the allowed tolerance. Coarse adjustment: by changing the initial tension of the return spring (change spring suspension Fig. 2).
Fine adjustment: with the aid of the eccentric (Fig. 3).

1/125 sec: Coarse adjustment: by bending the flange of the cam ring.
Fine adjustment: by readjustment of eccentric.

1/500 sec: By bending the lug of the speed cam.

Shutter speed: Measurements must be made with the cam ring set and fixed.

Nominal value	30	60	125	250	500	1/s
ta — lower limit	28.0	14.4	7.66	4.43	2.63	ms
ta — actual value	32.3	16.63	8.81	4.91	2.95	ms
ta — upper limit	37.3	19.21	10.14	5.92	3.51	ms

6. Concentricity and planar trueness test:

Concentricity: Maximum eccentricity between rear lens component (housing) and front lens component: 0.01 mm

Planar trueness: Maximum wobble between camera flange and rear lens flange: 0.015 mm

Maximum wobble between rear lens flange and front lens flange: 0.01 mm

* ta = time on axis (as measured through center of shutter, aperture — 0.5 mm ∅).

SYNCHRO-COMPUR 1-MX CN-1307-000

Cleaning of shutter

It is imperative to remove parts or sub-assemblies from the shutter for cleaning, which should be done by rinsing them in clean, grease-free trichloroethylene or perchloroethylene. Escapement and delayed action mechanisms should not be disassembled for cleaning.

Before reinstalling parts in the shutter, be sure they are completely dry and regreased in accordance with the lubricating instructions.

Enameled parts and parts with filled engravings or mounted aperture scale should never be wet-cleaned. Use a soft chamois leather or brush.

Lubricating instructions

The necessary lubricants, viz. (A) and (E) oil, can be ordered from us. Other lubricants should not be used, as only those tested in our factory will ensure proper functioning of shutters.

Apply a thin film of the prescribed lubricant to a glass plate and use a fine brush or foam rubber swab to apply the lubricant at the required point. In addition, the lubricant must be stirred briskly before use.

Lubricating chart 1307—000 indicates both the points to be serviced and the required lubricants.

Assembly and adjustment

CN-1307-000
Plate

1. **Speed selector ring 539** must rotate smoothly and engage perfectly in the notches corresponding to the different speeds. If necessary, slightly tension the spring lug of the speed selector ring or the cover plate **540.** 1

2. The **tensioning ring 528** must be a play-free fit on the mounting tube. It should not bind during tensioning. When the shutter has been tripped, it must move smoothly to the stop by the force of the tension spring **521.** In the course of this operation, the escapement detent 305 and the speed lever 669 must be lifted off (this corresponds to a setting of $^1/_{200}$ sec). 1

   When the tensioning ring is replaced, the adjustment must be checked or made in neutral position.

   The adjustment must be made on the tensioning ring stop lug (Fig. 1) by refiling or compressing the lug. 1

   Check: The tensioning ring 528 must be in contact with the stop. In this position it must still be possible to move the angular lever **210** past it without causing the blades to move. 5

3. **Blades 208, 267 and 268** and their bearings must be completely free from grease. The sequence of installation is marked on the illustration with the small figures 1 to 5. Insert the first blade 268 at the angular lever 210. The tips of the first blade 268 and the last (fifth) blade 267 are slightly bent upwards to facilitate sliding of the blades on each other. 6

   For inserting the blades it is advisable to disengage the spring **251** of the angular lever and to turn the blade ring **202** to open position.

   After the housing **101** has been placed on the base plate **201,** secure the screws **109** tightly and check the operation of the blade ring.

CN-1307-000
Plate

4. Keep the **diaphragm blades 105** and their bearings (blade cover 116 and diaphragm cover 106) completely free from grease. 7

   a) For installation hold the blade cover **116** by means of the assembly fixture WAM 1-1307-000-000 (Fig. 1). Insert the diaphragm blades 105 anticlockwise, the pin at the sharp inner edge of the diaphragm blade serving as a pivot in the blade cover 116 (Fig. 2).

   b) Then position the housing **101** with mounted diaphragm ring **108** (and diaphragm cover **106**) on the assembly fixture. For this purpose, the diaphragm ring must be set at "open diaphragm" (diaphragm ring lug at release), and the flash terminal must point to the corresponding recess in the fixture (Fig. 1). Move the diaphragm ring slightly until all blade guide pins have engaged the diaphragm cover 108.

   c) Secure the blade cover **116** and the screws **117** after turning over and removing the fixture.

   d) Check diaphragm for smooth operation.

5. Secure the **blade plate 225** by means of two long screws **234** on either side of the delayed action mechanism and by the two short screws **230.** 6

   Apply glyptal to the threads of the screws.

6. With the screw **211** firmly tightened, the **angular lever 210 and the X-angle lever 250** must move smoothly on the sleeve. 5

   Vertical play of the angular lever 210 must not exceed 0.05 mm.

   The spring **213** of the angular lever must rest only lightly on the base plate and should not rub against it.

7. **M-detent 640** and **idler 643** must be given the relative position shown in Fig. 3 in order to permit perfect operation of the contact spring. 4

   Move the hook-in lug **248** at the edge of the housing to the stop and secure screw **612** tightly.

8. **A-plate 621** 4

   a) Check level position of locking lever and shift lever.

   b) Insert plate and tension M-detent **305** slightly until the plate is perfectly seated.

      Lightly screw down the plate with the aid of screw **680.**

   c) Swing the shift lever **657** until it guides the trip pin of the anchor plate, **634,** (on M-plate 622) with its fork. It must swing back into neutral position under the force of the anchor plate spring **647.** 6

   d) Connect A-plate and synchronizing lever **685** loosely by means of screw **679.** 4

   e) Insert contact spring **606,** spacing collar **675** and auxiliary spring **518** (Fig. 3). 4

   f) Tighten both screws (679, 680) and insert the spring for the synchronizing lever **687.**

   Check: The detent must be easy to tension and must swing out the locking lever during its return travel.

   Locking lever 664 (Figs. 1 and 2), B-lever 693, speed lever 669, T-lever 694 and the release 508 must move normally under the force of the corresponding springs. 1a4

CN-1307-000
Plate

9. **Synchronization** 8

In "M" position, the lug 657 of the shift lever must be about 0.2 mm away from the contact spring 606 (Fig. 6).
Contact clearance = 0.8 to 1.2 mm (Fig. 6).
Contact pressure in M-position = 10 . . . 20 gf (Fig. 7).
Adjustment of M-contact at 1 (Fig. 6).
(Measuring procedure: slowly tension shutter; during this operation, the shift lever 657 will swing outward and drop back. Stop tensioning in this phase and slowly guide the tensioning ring back. The shift lever will then press the contact spring 606 against the stop, as a result of which the spring must be deflected 0.2 . . . 0.4 mm (Fig. 7). Hold the tensioning ring down and interrupt the contact by means of counterpressure, as shown in Fig. 7).

M-firing delay as measured from contact making to halfopen shutter = 16.5 ms ± 10%.

X-contact closes when the tips of the blades occupy a position between 25.0 diameter and full aperture.
Adjustment of X-contact at 2 (Fig. 6).

Adjustment of firing delay 8
for settings of 1 sec . . . $^{1}/_{200}$ sec:
    by bending the locking lever — Fig. 6, adjustment at 3 —
for a setting of $^{1}/_{400}$ sec:
    by bending the spring 697 of the locking lever (Fig. 6), adjustment at 4 —
    The firing delay becomes shorter as the spring tension is reduced, and vice versa.

10. The **X-control lever 254** runs with a pivot in the **opening lever 252.** Check operation of both levers after tightening the screw **258.** 5
The end of the X-control lever 254 and the shift lever 657 must lie on a mutual plane in order to guarantee perfect functioning (Fig. 2). If necessary, align the X-control lever accordingly.

11. **Delayed action mechanism 400.** The duration of delay is between 9 and 12 sec. The timing of the instant at which the tensioning ring hook slips off the hook wheel 408 can be influenced by bending the lug (Fig. 1). The hook wheel 408 will thus adopt a different angular position, so that the delay is changed within certain limits. In addition, the hook wheel must turn in such manner as to drive the delay mechanism properly after tripping (9-12 sec), in other words, it must not slip off immediately. 3
During operation, the hook must not exert any pressure on the plate.

CN-1307-000
Plate
2

12. Escapement 300

a) Hook the detent spring **309** in the first notch.

b) Turn the idler **314** so that the return spring (Fig. 1) will neither jam when the detent **305** is swung in nor come into contact with the pinion of the detent wheel **310** when the detent is swung out (to the first tooth).

c) Install the escapement; tighten screws **304** and **323** only slightly.

d) Slide the escapement on the side of the anchor slowly from the outside to the inside until the tensioning ring 528 operates smoothly.

e) **Speed adjustment** (keep to stated order of operations!)

1 second: Rotate escapement about the screw 304 until the 1 sec speed is within tolerance. If the speed should be appreciably too fast, then increase the tension of the detent spring (Hook the spring (309) in one of the next notches.)
With tensioned shutter it must be possible to lift the anchor plate about 0.2 mm from the tensioning ring (Fig. 3).
A minimum play of 0.2 mm is required between fully swung-in detent 305 and tensioning ring lug (Fig. 1):
The pallet should engage the corresponding tooth of the balance wheel at about ½ to ¾ of the height of the tooth (Fig. 4). If necessary, the corresponding adjustment can be made at the locking lug of the lower plates 302 (Fig. 2). 8
Secure the escapement free from tension with the aid of the **screws 304** and **323**.

$^1/_{10}$ second: by bending the detent pin (Fig. 5).
$^1/_{100}$ second: by varying the width of the slot in the speed selector ring (Fig. 5).

With these three adjustments all other speeds are automatically adjusted as well (Fig. 5). 8

Shutter speeds:	1; 2; 5; 10; 25; 50; 100;	200; 400	(1/sec)
Tolerances:	± 15%	± 20%	

13. Concentricity and planar trueness test

Concentricity: Maximum eccentricity between base plate 201 and housing 101 : 0.0 mm

Planar trueness: Maximum wobble between mounting tube of front lens component and rear lens flange: 0.01 mm.

COMPUR 000-X CN–1915–001
Tensioning shutter

Cleaning of shutter: as under CN–1914–000

Lubricating instructions: as under CN–1914–000; lubricating chart CN–1915–001

Assembly and adjustment:

CN-1915-001
Plate

1. The **blades 208** and their bearings must be completely free from grease. 3

2. The **diaphragm blades 105 and the shim 119** as well as their bearings must be completely free from grease. 3

3. The **cam ring 552 and the speed selector ring 539** are fixed relative to each other by groove and lug. If necessary, bend the spring lug to improve stop engagement. 1

4. The **thrust pawl spring 533** must be plane, and its long end must be in contact with the thrust pawl rivet. 1

5. **Synchronization**

   Contact clearance: min. 0.3 mm (see Fig. 3) 1
   When adjusting the contact spring, care should, in addition be taken to ensure a sufficient overlap between the spring tip and the detent lever lug **242.**

   Contact must be made when the tips of the blades are clear of the full aperture of the shutter.

6. **Locking lever 661:** If the drive 514 or the locking lever has to be exchanged, the locking lever must be checked for correct operation. 1 a. 2

   The locking lever should operate simultaneously with or slightly later than the thrust pawl (514) (0° to 1°30' as measured at the tensioning shaft). If this is not the case, another locking lever should be chosen. For this purpose, six locking levers of different length are available (see note 90). The set of levers is marked 0 - 5.

7. **Adjustment of escapement:**

   The positions of the cam ring corresponding to speeds of $^1/_{250}$ and $^1/_{30}$ sec are indicated in Fig. 2. 2

   If the shutter to be repaired is provided with a speed selector ring with click stops, the adjustment should be made in a click-stop position.

   $^1/_{30}$ sec: by changing the initial tension of the detent spring (344) 2
   $^1/_{60}$ sec:
   $^1/_{125}$ sec: by bending the detent pin (305)
   $^1/_{250}$ sec: by bending the cam ring lug (552) Fig. 2

   Shutter speeds:
   Measurements must be made with the cam ring set and fixed.

Nominal value				
t_a - lower limit	28.0	14.4	7.66	4.43 ms
t_a - actual value	32.2	16.63	8.81	4.91 ms
t_a - upper limit	37.3	19.21	10.14	5.92 ms

(t_a = time on axis, as measured through the center of the shutter)

8. **Concentricity and planar trueness test:**

   Concentricity: Maximum eccentricity between rear lens component (housing) and front lens component: 0.01 mm.
   Planar trueness: Maximum wobble between rear lens flange and front lens flange: 0.01 mm.

COMPUR 000-X CN-1916-001
Single-action shutter

Cleaning of shutter: as under CN–1914–000

Lubricating instructions: as under CN–1914–000,
see also lubrication chart CN–1916–001 (CN–1915–001)

Assembly and adjustment: See picture plates CN–1915–001 and repair instructions CN–1915–001, items **1** through **5, 7** and **8** unchanged.

CN-1916-001
Plate
1

9. **Slip-on pinion 722, tensioning ring 528** and **drive 514:**

   If one of these parts is replaced, the sequence of operation should be checked. The thrust pawl (514) must in any case operate shortly before the shutter is tripped by the tensioning ring 528 (min. 50' to max. 2° as measured at the tensioning ring). This ensures that the shutter does not open if the tensioning process is interrupted prematurely.

   If this requirement is not met, another tensioning ring 528 should be selected. 9 tensioning rings are available, in each of which the last tooth is of different height (see note 109).

COMPUR 000-X CN–1916–004
with wedge differential and film speed setting

Cleaning of shutter: as under CN–1914–000

Lubricating instructions: as under CN–1914–000
see lubrication chart CN–1916–001 (CN–1915–001)

9. **Assembly and adjustment:** See also picture plates CN–1915–001 and CN–1916–001 Repair instructions CN–1915–001, items **1** through **5, 7** and **8** unchanged. Item 6 not applicable.

   CN-1916-004
   Plate
   1

   Slip-on pinion 772, tensioning ring 528 and **drive 514:**
   If one of these parts is replaced, the sequence of operation should be checked. The thrust pawl (514) must in any case operate shortly before the shutter is tripped by the tensioning ring 528 (min. 50' to max. 2° as measured at the tensioning ring). This ensures that the shutter does not open if the tensioning process is interrupted prematurely.

   If this requirement is not met, another tensioning ring 528 should be selected. 9 tensioning rings are available, in each of which the last tooth is of different height (see note 109).

10. **Aperture setting ring 590:**

    The recess in the ring serves as a bearing for the **thrust wedge 185**, the prism face of which is pushed by the feeler pin. The wedge thus is in contact with the oblique side of the film speed ring 576 (see Fig. 1). 1

    Check: Clearance between shutter flange and contact point of feeler pin on thrust wedge 185:
    At a setting of 250/22/12° DIN = 3.6 mm
    At a setting of B/2.8/33° DIN = 7.0 mm